DRAFT

PHASE I UNDERGROUND TANK LEAK INVESTIGATION REPORT FOR DOUGLAS AIRCRAFT COMPANY'S C6 FACILITY LOS ANGELES, CALIFORNIA

Prepared for:

Douglas Aircraft Company
3855 Lakewood Boulevard
Long Beach, California 90844

Project No. 41863B
June 1987

PHASE I UNDERGROUND TANK LEAK INVESTIGATION REPORT FOR DOUGLAS AIRCRAFT COMPANY'S C6 FACILITY LOS ANGELES, CALIFORNIA

1.0 INTRODUCTION

As part of the on-going underground tank leak investigation for Douglas Aircraft Company (DAC), Woodward-Clyde Consultants installed and sampled soil borings in the vicinity of Tanks 19T and 20T at Douglas' Los Angeles, California C6 Facility (Figure 1). The purpose of the boring program was to evaluate the leakage that resulted from the underground piping associated with tanks 19T and 20T.

This report contains the investigation procedures, the results of the sample analysis, a discussion of the results, and recommendations for further steps.

2.0 SITE HYDROGEOLOGY

The Douglas Aircraft C6 Facility, located on the Torrance Plain of the Los Angeles Coastal Basin, is underlain by the Lakewood Formation. The primary aquifers beneath the site are the "Semi-Perched" and the Gage. The following is a description of the aquifers and the aquicludes beneath the site.

2.1 "Semi-perched" Aquifer

The "Semi-perched" Zone is a coarse sand and gravel aquifer that varies in thickness from 0 to 60 feet. It occurs near the surface throughout much of the coastal plain, but is very irregular in occurrence. It is mainly comprised of stream sediments, although it also consists of marine deposits beneath the Torrance Plain. (Marine deposits have been identified in the borings at the C6 Facility.) Wells in the "Semi-perched" zone yield small quantities of poor quality water, which is of little beneficial use.

2.2 Bellflower Aquitard

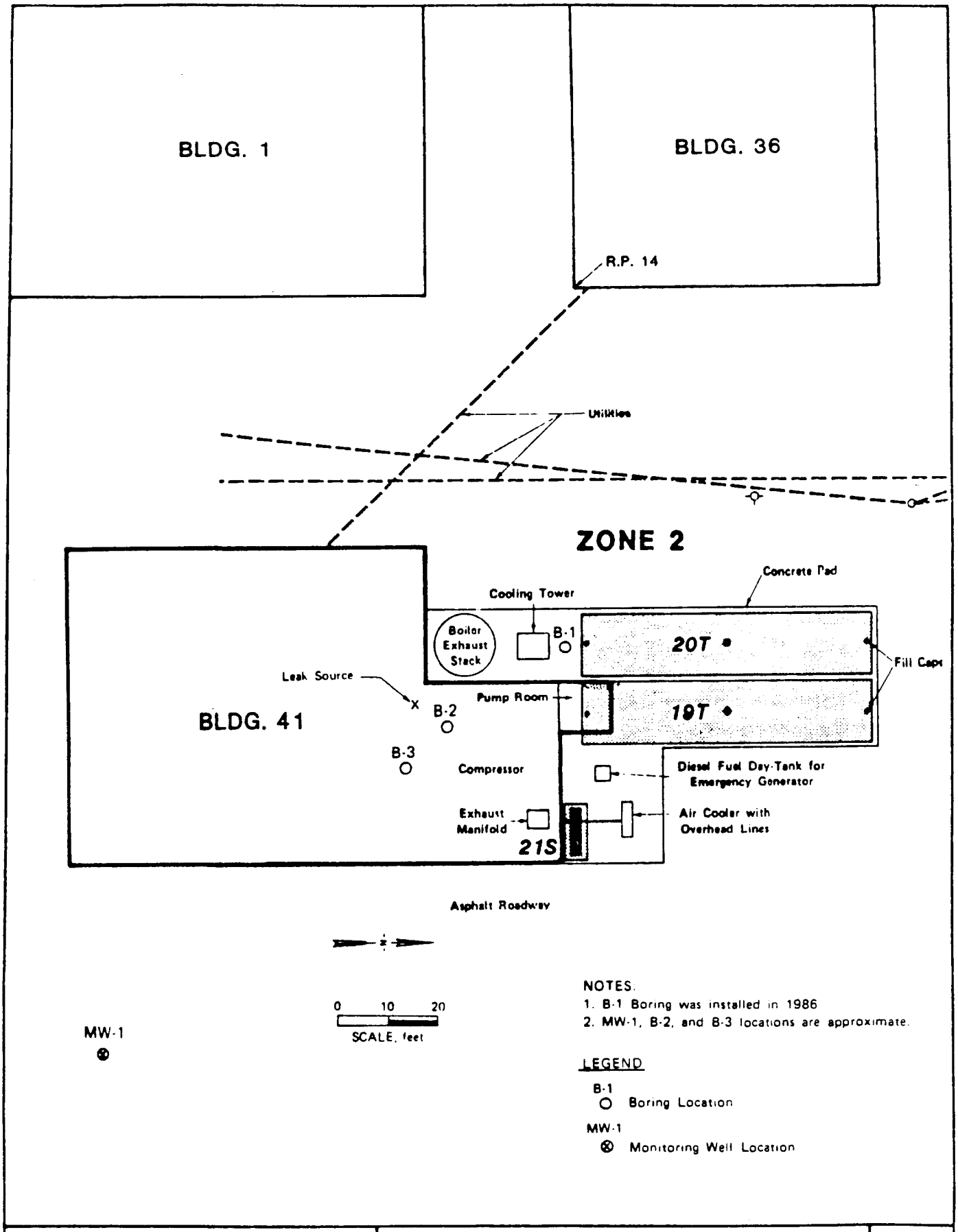
The "Semi-perched" Zone is underlain by the Bellflower Aquitard, which separates this zone from the underlying Gage Aquifer. The Bellflower Aquitard consists of low permeability, fine grained sediments, and acts as a confining unit on the underlying Gage Aquifer. The Bellflower is a heterogeneous mixture of continental and marine sediments, and also contains sand and gravel lenses. It varies in thickness from 0 to 200 feet and may be approximately 60 to 80 feet thick in the site area.

2.3 Gage Aquifer

The lowest member of Lakewood Formation, the Gage Aquifer, is also known as the "200 foot sand". It extends over most of the Coastal Plain. In the site vicinity it consists of coarse sand and gravel, and from an evaluation of the regional data appears to be approximately 40 to 80 feet thick.

2.4 Site Specific Interpretation

The C6 site is approximately 50 feet above Mean Sea Level. The uppermost 200 feet of the subsurface consists of the Lakewood Formation and contains the "Semi-perched" and Gage Aquifers, separated by the Bellflower Aquitard. Regional



Project DOUGLAS AIRCRAFT CO. Project No. 41863B	LOCATION MAP FOR MW-1, B-1, B-2, AND B-3	Fig. 2

TABLE 4.1

SOIL ANALYSIS FOR BORINGS B2 AND B3

Sample No.	Depth (ft)	Total Petroleum Hydrocarbon (ppm)
B2-2-3	10	5,000
B2-7-3	30	6,000
B2-7-4	35	14,000
B2-8-4	42	2,000
B2-9-4	47	2,000
B2-10-4	50	19,000
B3-1-4	5	2,900
B3-2-4	10	27
B3-3-4	15	1,200
B3-4-4	20	4,400
B3-5-3	25	13,000
B3-6-3	30	4,100

Borings are near tanks 19T and 20T at C6 Facility

The presence of solvents in the ground water does not appear to be the result of the leak associated with Tanks 19T and 20T. The leak from Tanks 19T and 20T was a diesel leak, and would not be expected to produce halogenated solvents at the concentrations present in the ground water.

The fuel oil concentrations in the soil near Tanks 19T and 20T have apparently resulted from the leak of diesel in this area. The fuel oil is present in the soil to a depth between 50 and 70 feet near the source, with lateral spreading estimated at up to 30 feet.

5.0 RECOMMENDATIONS

The results obtained from the field investigation indicated that fuel oil is present in the soil in the vicinity of Tanks 19T and 20T. However, the compounds present in the ground water are apparently not due to the release of fuel oil. Therefore, it is recommended that further investigation be implemented to delineate the extent of the solvents in the ground water and identify the source(s) of these solvents.

The planned investigation would at a minimum entail the following:

- Installation of an additional boring near the source of the fuel oil release. This boring would be used to evaluate whether the fuel oil had reached ground water, by sampling between 50 feet and 65 feet.
- Installation of three additional observation wells around Tanks 19T and 20T, to evaluate whether these tanks are (were) the source of the solvents in the ground water.

BORING LOCATION	MW-1 (41)	ELEVATION AND DATUM	N/A
DRILLING AGENCY	Datum Exploration, Inc. / DRILLER James	DATE STARTED 3-25-87	DATE FINISHED 3-26-87
DRILLING EQUIPMENT	Mobile Drill B-61, 10-inch O.D., H.S.A.	COMPLETION DEPTH (FT) 91	ROCK DEPTH (FT) –
DIAMETER AND TYPE OF WELL CASING	2-inch Plastic, Flush Threaded	NO. OF SAMPLES: DIST 5	UNDIST – / CORE –
TYPE OF PERFORATION	.02 Slot	WATER DEPTH (FT): FIRST 74.5	COMPL – / 24 HRS –
TYPE OF BACKFILL	No. 12 Silica Sand	LOGGED BY S. Donaldson	CHECKED BY B. Jacobs
TYPE OF SEAL	Bentonite Pellet Plug and Bentonite Grout		

DEPTH (FEET)	DESCRIPTION	Lithology	Observation Well	SAMPLES No.	SAMPLES Type	SAMPLES Blow Count	SAMPLES Drilling Rate/Time	REMARKS
	Asphalt						0905	Background OVA reading = 1-2 ppm
	Damp, reddish-brown, SILTY SAND (SP) with clay and gravel. Becomes black							
5	Becomes reddish brown, no gravel.							
10	Becomes medium brown.							
	CLAYEY SAND (SC).						0915	
15								
20								
25	Stiff, damp, medium brown, CLAYEY SILT (ML) with some fine sand.							
30	Becomes hard with more clay.						0920	
35								
	Lense of volcanic (?) angular gravel.							

Project: DOUGLAS AIRCRAFT COMPANY TORRANCE
Project No.: 41863B

LOG OF BORING MW-1(41)

Fig. A-1

LA/OR-0783-236R

WOODWARD-CLYDE CONSULTANTS

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG: Lithology	GRAPHIC LOG: Observation Well	GRAPHIC LOG: OVA (ppm)	SAMPLES: No	SAMPLES: Type	SAMPLES: Blow Count	SAMPLES: Drilling Rate/Time	REMARKS
	Very stiff, wet, dark brown SILT (ML) (continued).								
	Very dense, wet, brown, fine SAND (SP).				12		6		
80									
85									
90	Stiff, moist, dark brown, SILTY CLAY (CL).								
	Bottom of Boring at 91 feet.								
95									
100									
105									
110									
115									

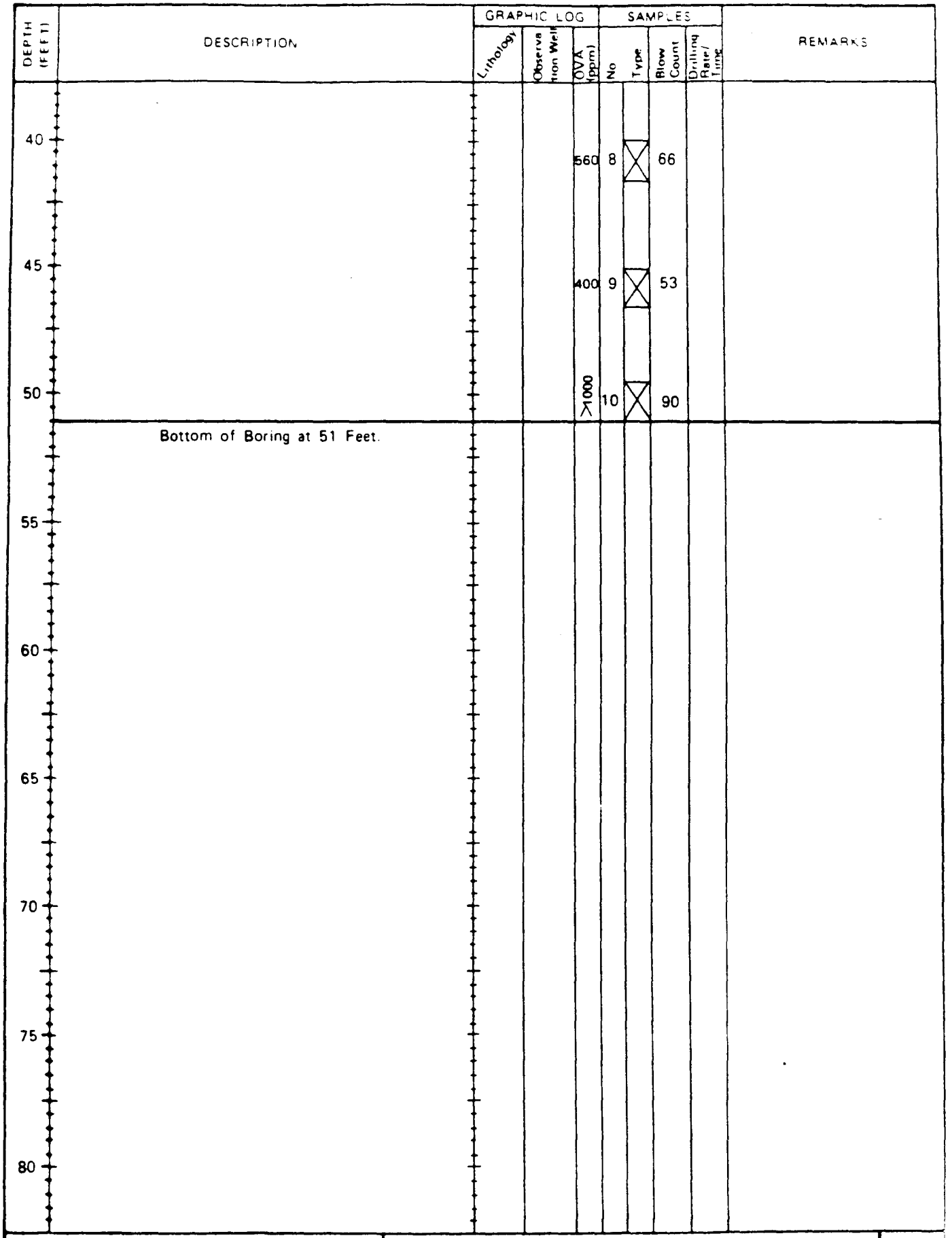
Project: DOUGLAS AIRCRAFT COMPANY TORRANCE
Project No.: 41863B

CONT. LOG OF BORING MW-1(41)

Fig. A-3

LA/OR-0783-236R

WOODWARD – CLYDE CONSULTANTS



Project: DOUGLAS AIRCRAFT Project No.: 41863B	CONT. LOG OF BORING B-2	Fig. A-5

LA:OR:0783:236R

WOODWARD – CLYDE CONSULTANTS

APPENDIX B

CHEMICAL ANALYSIS RESULTS

April 17, 1987

WOODWARD-CLYDE
203 N. Golden Circle Drive
Santa Ana, CA 92705

Attn: Allistair Callendar

JOB NO. 5664

WEST COAST ANALYTICAL SERVICE, INC.
ANALYTICAL CHEMISTS

LABORATORY REPORT

Samples: Forty (40) soil samples
Date Received: 4-10-87
Purchase Order No: Project 41863B

Fifteen (15) soil samples were analyzed for hydrocarbon content according to a modified EPA method 8015. The results are reported in the following table.

B. Michael Hovance
for
Jim Bonde
Senior Chemist

D.J. Northington, Ph.D.
Technical Director

9840 Alburtis Avenue • Santa Fe Springs, California 90670 • 213/948-2225

WEST COAST ANALYTICAL SERVICE, INC.

CLIENT: WOODWARD CLYDE
SAMPLE: MW-1,A
ANALYSIS TYPE: EPA METHOD 8240 (624)

ORGANICS ANALYSIS DATA RESULTS

DATE RECEIVED:	04/13/87	GCMS FILENAME:	5677V2
LEVEL:	LOW	MATRIX:	WATER
DATE PREPARED:	04/15/87	DATE ANALYZED:	04/15/87
STANDARD ID:	VOA457	INSTRUMENT ID:	5100
SAMPLE AMOUNT:	100UL		

CAS #	COMPOUND	CONC: UG/L(PPB)	DETECTION LIMIT
108-90-7	CHLOROBENZENE	ND	50.
100-41-4	ETHYLBENZENE	ND	50.
100-42-5	STYRENE	ND	50.
95-47-6	TOTAL XYLENES	ND	50.
108-41-8	M-CHLOROTOLUENE	ND	50.
541-73-1	1,3-DICHLOROBENZENE	ND	50.
106-46-7	1,4-DICHLOROBENZENE	ND	50.
95-50-1	1,2-DICHLOROBENZENE	ND	50.
120-82-1	1,2,4-TRICHLOROBENZENE	ND	50.

WEST COAST ANALYTICAL SERVICE, INC.

CLIENT: WOODWARD CLYDE
SAMPLE: MW-1,B
ANALYSIS TYPE: EPA METHOD 8240 (624)

ORGANICS ANALYSIS DATA RESULTS

DATE RECEIVED:	04/13/87	GCMS FILENAME:	5677V3
LEVEL:	LOW	MATRIX:	WATER
DATE PREPARED:	04/15/87	DATE ANALYZED:	04/15/87
STANDARD ID:	VOA457	INSTRUMENT ID:	5100
SAMPLE AMOUNT:	100UL		

CAS #	COMPOUND	CONC: UG/L(PPB)	DETECTION LIMIT
74-87-3	CHLOROMETHANE	ND	300.
74-83-9	BROMOMETHANE	ND	300.
75-01-4	VINYL CHLORIDE	ND	300.
75-00-3	CHLOROETHANE	ND	300.
75-09-2	METHYLENE CHLORIDE	ND	500.
67-64-1	ACETONE	ND	500.
107-02-8	ACROLEIN	ND	500.
107-13-1	ACRYLONITRILE	ND	500.
75-15-0	CARBON DISULFIDE	ND	50.
75-35-4	1,1-DICHLOROETHENE	2500.	50.
75-34-3	1,1-DICHLOROETHANE	ND	50.
156-60-5	TRANS-1,2-DICHLOROETHENE	ND	50.
109-99-9	TETRAHYDROFURAN	ND	50.
75-69-4	TRICHLOROFLUOROMETHANE	ND	50.
76-13-1	FREON-TF	ND	50.
106-93-4	ETHYLENE DIBROMIDE	ND	50.
123-91-1	1,4-DIOXANE	ND	50.
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	ND	50.
67-66-3	CHLOROFORM	ND	50.
107-06-2	1,2-DICHLOROETHANE	ND	50.
78-93-3	2-BUTANONE	ND	500.
71-55-6	1,1,1-TRICHLOROETHANE	120.	50.
16-23-5	CARBON TETRACHLORIDE	ND	50.
108-05-4	VINYL ACETATE	ND	300.
75-27-4	BROMODICHLOROMETHANE	ND	50.
79-34-5	1,1,2,2-TETRACHLOROETHANE	ND	50.
78-87-5	1,2-DICHLOROPROPANE	ND	50.
10061-02-6	TRANS-1,3-DICHLOROPROPENE	ND	50.
79-01-6	TRICHLOROETHENE	3600.	50.
124-48-1	CHLORODIBROMOMETHANE	ND	50.
79-00-5	1,1,2-TRICHLOROETHANE	ND	50.
71-43-2	BENZENE	ND	50.
10061-01-5	CIS-1,3-DICHLOROPROPENE	ND	50.
110-75-8	2-CHLOROETHYLVINYLETHER	ND	500
75-25-2	BROMOFORM	ND	50.
119-78-6	2-HEXANONE	ND	300
108-10-1	4-METHYL-2-PENTANONE	ND	300
127-18-4	TETRACHLOROETHENE	ND	50
108-88-3	TOLUENE	ND	50.

WEST COAST ANALYTICAL SERVICE, INC.

CLIENT: WOODWARD CLYDE
SAMPLE: MW-1, B

TENTATIVELY IDENTIFIED COMPOUNDS

	COMPOUND NAME	FRACTION	CONCENTRATION UG/L(PPB)
1	NONE FOUND	VOA	

WEST COAST ANALYTICAL SERVICE, INC.

CLIENT: WOODWARD CLYDE
SAMPLE: TRIP BLANK
ANALYSIS TYPE: EPA METHOD 8240 (624)

ORGANICS ANALYSIS DATA RESULTS

DATE RECEIVED:	04/13/87	QCMS FILENAME:	5677V4
LEVEL:	LOW	MATRIX:	WATER
DATE PREPARED:	04/15/87	DATE ANALYZED:	04/15/87
STANDARD ID:	VOA457	INSTRUMENT ID:	5100
SAMPLE AMOUNT:	5.0ML		

CAS #	COMPOUND	CONC: UG/L(PPB)	DETECTION LIMIT
74-87-3	CHLOROMETHANE	ND	5.
74-83-9	BROMOMETHANE	ND	5.
75-01-4	VINYL CHLORIDE	ND	5.
75-00-3	CHLOROETHANE	ND	5.
75-09-2	METHYLENE CHLORIDE	ND	10.
67-64-1	ACETONE	ND	10.
107-02-8	ACROLEIN	ND	10.
107-13-1	ACRYLONITRILE	ND	10.
75-15-0	CARBON DISULFIDE	ND	1.
75-35-4	1,1-DICHLOROETHENE	ND	1.
75-34-3	1,1-DICHLOROETHANE	ND	1.
156-60-5	TRANS-1,2-DICHLOROETHENE	ND	1.
109-99-9	TETRAHYDROFURAN	ND	1.
75-69-4	TRICHLOROFLUOROMETHANE	ND	1.
76-13-1	FREON-TF	ND	1.
106-93-4	ETHYLENE DIBROMIDE	ND	1.
123-91-1	1,4-DIOXANE	ND	1.
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	ND	1.
67-66-3	CHLOROFORM	ND	1.
107-06-2	1,2-DICHLOROETHANE	ND	1.
78-93-3	2-BUTANONE	ND	10.
71-55-6	1,1,1-TRICHLOROETHANE	ND	1.
16-23-5	CARBON TETRACHLORIDE	ND	1.
108-05-4	VINYL ACETATE	ND	5.
75-27-4	BROMODICHLOROMETHANE	ND	1.
79-34-5	1,1,2,2-TETRACHLOROETHANE	ND	1.
78-87-5	1,2-DICHLOROPROPANE	ND	1.
10061-02-6	TRANS-1,3-DICHLOROPROPENE	ND	1.
79-01-6	TRICHLOROETHENE	ND	1.
124-48-1	CHLORODIBROMOMETHANE	ND	1.
79-00-5	1,1,2-TRICHLOROETHANE	ND	1.
71-43-2	BENZENE	ND	1.
10061-01-5	CIS-1,3-DICHLOROPROPENE	ND	1.
110-75-8	2-CHLOROETHYLVINYLETHER	ND	10.
75-25-2	BROMOFORM	ND	1.
119-78-6	2-HEXANONE	ND	5.
108-10-1	4-METHYL-2-PENTANONE	ND	5.
127-18-4	TETRACHLOROETHENE	ND	1.
108-88-3	TOLUENE	ND	1.

WEST COAST ANALYTICAL SERVICE, INC.

CLIENT: WOODWARD CLYDE
SAMPLE: TRIP BLANK

TENTATIVELY IDENTIFIED COMPOUNDS

	COMPOUND NAME	FRACTION	CONCENTRATION UG/L(PPB)
1	NONE FOUND	VOA	

WEST COAST ANALYTICAL SERVICE, INC

CLIENT: WOODWARD-CLYDE
SAMPLE MW-1(41)A
ANALYSIS TYPE EPA METHOD 8240 (624)

ORGANICS ANALYSIS DATA RESULTS

DATE RECEIVED:	03/27/87	GCMS FILENAME:	5557V3
LEVEL:	LOW	MATRIX:	WATER
DATE PREPARED:	04/01/87	DATE ANALYZED:	04/01/87
STANDARD ID:	VOA280	INSTRUMENT ID:	5101
SAMPLE AMOUNT:	100UL		

CAS #	COMPOUND	CONC: UG/L(PPB)	DETECTION LIMIT
108-90-7	CHLOROBENZENE	ND	50
100-41-4	ETHYLBENZENE	ND	50
100-42-5	STYRENE	ND	50
95-47-6	TOTAL XYLENES	ND	50
108-41-8	M-CHLOROTOLUENE	ND	50
95-50-1	1,2-DICHLOROBENZENE	ND	50
541-73-1	1,3-DICHLOROBENZENE	ND	50
106-46-7	1,4-DICHLOROBENZENE	ND	50
120-82-1	1,2,4-TRICHLOROBENZENE	ND	50

Data Reporting Qualifiers

Value - If the result is a value greater than or equal to the Detection Limit (DL), the value is reported

ND - Indicates that the compound was analyzed for but not detected. The minimum DL for the sample with the ND is reported based on necessary concentration or dilution actions.

TR - Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the specified DL but greater than zero.

January 9, 1987

WOODWARD-CLYDE
203 N. Golden Circle Drive
Santa Ana, CA 92705

Attn: Kevin Gibson

JOB NO. 4968

WCAS
WEST COAST
ANALYTICAL
SERVICE, INC.
ANALYTICAL CHEMISTS

LABORATORY REPORT

Samples: Nineteen (19) soil samples
Date Received: 1-6-87
Purchase Order No: 41863B

Ten (10) samples were analyzed for total petroleum hydrocarbons by EPA method 418.1. The results are reported below:

Sample.No.	Parts Per Million Total Petroleum Hydrocarbons
2-7-4	14000
2-8-4	2000
2-9-4	2000
2-10-4	19000
3-1-4	2900
3-2-4	27
3-3-4	1200
3-4-4	4400
3-5-3	13000
3-6-3	4100
Detection Limit	10

Date Extracted: 1-8-87
Date Analyzed: 1-8-87

Isabelle Gundran
Chemist.

D.J. Northington, Ph.D.
Technical Director

9840 Alburtis Avenue • Santa Fe Springs, California 90670 • 213/948-2225

Woodward·Clyde Consultants

CHAIN OF CUSTODY RECORD

SHIPMENT NO.: ______

PAGE 1 OF 1

DATE 4/13/87

PROJECT NAME Douglas - Torrance

PROJECT NO.: 41863B

Sample Number	Location	Type of Sample: Material	Type of Sample: Method	Type of Container	Type of Preservation: Temp	Type of Preservation: Chemical	Analysis Required*
MW-1(41)A		Water	Bailed	40 ml Vial	Cool		8240
" B		"	"	40 ml Vial	↓		8240
" C		"	"	500 ml Amber	↓		Hold SAMPLES
" D		"	"	500 ml Amber	↓		Hold SAMPLES
" E		"	"	500 ml Amber	↓		Hold SAMPLES
" F		"	"	500 ml Amber	↓		Hold SAMPLES
Trip Blank		"		40 ml Vial	↓		8240

Total Number of Samples Shipped 7 Sampler's Signature: [signature]

Relinquished By:	Received By:	Date / Time
Signature [signature] Printed Name Brian JACOBS Company Woodward-Clyde Reason Analysis	Signature Margaret Felt Printed Name Margaret Felt Company WCHS	Date 4/13/87 Time 4:50
Signature ______ Printed Name ______ Company ______ Reason ______	Signature ______ Printed Name ______ Company ______	Date ___ / Time ___
Signature ______ Printed Name ______ Company ______ Reason ______	Signature ______ Printed Name ______ Company ______	Date ___ / Time ___
Signature ______ Printed Name ______ Company ______ Reason ______	Signature ______ Printed Name ______ Company ______	Date ___ / Time ___

Special Shipment / Handling / Storage Requirements

* Note – This does not constitute authorization to proceed with analysis

LA CF

Woodward-Clyde Consultants

SHIPMENT NO.: _____

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

DATE 12 12 91 82

PROJECT NAME: Douglas Aircraft C6

PROJECT NO.: 41863B

Sample Number	Location	Type of Sample: Material	Type of Sample: Method	Type of Container	Type of Preservation: Temp	Type of Preservation: Chemical	Analysis Required*
	B2						
~~B2-1-3~~	B2 1'	Soil	CANOD	BRASS TUBE	ICE		~~HOLD~~
B2-1-4							HOLD
B2-2-3	5'						EPA 418.1 (X)
B2-2-4							HOLD
B2-3-3	10'						HOLD
B2-3-4							"
B2-4-3	15'						HOLD
B2 4-4							"
B2 5-3	20'						HOLD
B2 5-4							"
B2 7-3	30'						EPA 418.1 (X)
~~B2 6-3~~	25'						~~HOLD~~
B2 6-4							HOLD
~~B2 5-5~~	30'						~~EPA 418.1~~
B2 7-4							HOLD ~~B2 6-5~~

Total Number of Samples Shipped: 12 | Sampler's Signature: Kevin R. Gibson / Brian Jacobs

Relinquished By: Signature: Kevin R. Gibson; Printed Name: Kevin R. Gibson; Company: WCC; Reason: TESTING	Received By: Signature: Shelly Rinkel; Printed Name: Shelly Rinkel; Company: WCAS	Date: 12/29/91; Time: 3:20
Relinquished By: Signature: ; Printed Name: ; Company: ; Reason:	Received By: Signature: ; Printed Name: ; Company:	Date: / / ; Time:
Relinquished By: Signature: ; Printed Name: ; Company: ; Reason:	Received By: Signature: ; Printed Name: ; Company:	Date: / / ; Time:
Relinquished By: Signature: ; Printed Name: ; Company: ; Reason:	Received By: Signature: ; Printed Name: ; Company:	Date: / ; Time:

#4932

Special Shipment / Handling / Storage Requirements:

X Please hold samples as noted above until told to do otherwise which will be done w/in 3 working days of receipt.

* Note – This does not constitute authorization to proceed with analysis

LA OR-0183-42

BOE-C6-0014264